

Appl. No. 10/044,609
Amdt. dated December 17, 2003
Reply to Office Action of September 17, 2003

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application. Please cancel claims 3 and 6, and amend claims 1-2, 4, 7-9, 11 and 15 as follows:

LISTING OF CLAIMS:

1. (Currently Amended) A controller for a water softener, said water softener having an ion exchange resin capable of receiving hard water ions from hard water during a softening step and releasing the hard water ions during a regeneration step, said controller comprising a processor programmed to cause termination of the softening step and initiate the regeneration step without regard to time when both of a first and a second condition are met; a means for determining when the resin is saturated with hard water ions; and a means for determining when current water usage is at or below a predetermined flow rate, said first condition being met when said the resin is saturated with hard water ions, and said second condition being met when current demand for water is at or below a predetermined flow rate.

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2. (Currently Amended) The controller of claim 1 further comprising wherein said means for determining when the resin is saturated with hard water ions is an input from a hardness sensor ~~used to determine when said first condition is met.~~

3. (Cancelled)

4. (Currently Amended) The controller of claim 3-1 wherein said means for determining when current water usage is at or below a predetermined flow rate is data is from a flow meter.

5. (Original) The controller of claim 1, wherein said controller comprises a microprocessor, one or more control valves driven by said microprocessor, a timer, and a user interface to receive input for said controller.

6. (Cancelled)

7. (Currently Amended) The controller of claim 1 being configured for having a prescribed delay between monitoring operations when water demand exceeds

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said predetermined flow rate, ~~said controller waits a prescribed delay time then determines the flow rate again.~~

8. (Currently Amended) A water softener comprising:
- a housing;
- an inlet to said housing for receiving inflow of hard water;
- an outlet from said housing for dispensing outflow of treated water;
- 5 an ion exchange resin held within said housing for receiving hard water ions from the hard water during a softening step and releasing the hard water ions during a regeneration step;
- a first means for determining when said resin is saturated with the hard water ions;
- 10 a second means for determining when current treated water demand is at or below a predetermined flow rate; and
- a processor programmed to cause termination of a softening step and initiate a regeneration step without regard to time when both of a first and a second condition are met, said first condition being met when said first means determines that said resin is saturated with hard water ions, and said second condition being met when said second means

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determines that the current demand for soft water is at or below athe predetermined flow rate.

9. (Currently Amended) The water softener of claim 8, further comprising wherein said first means comprises an electronic hardness sensor for determining when said first condition is met.

10. (Original) The water softener of claim 8, further comprising electronic memory mounted on or held within said housing for storing information and calculating if said resin is saturated with hard water ions.

11. (Currently Amended) The water softener of claim 8, further comprising wherein said second means comprises a flow meter for determining when said second condition is met.

12. (Original) The water softener controller of claim 8 further comprising one or more control valves, wherein said processor is configured for causing

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termination of said softening step and initiation of said regeneration step by movement of said valves causing one or more of said valves to change position.

13. (Original) The water softener controller of claim 8 wherein said processor is further programmed with alternate modes of regeneration.

14. (Original) The water softener controller of claim 13 wherein said processor further receives input as to the quality of said hard water and offers only said alternate modes of regeneration if the water hardness is sufficiently high or if iron is present in said hard water.

15. (Currently Amended) A method for controlling a water softener containing an ion exchange resin capable of receiving hard water ions during a softening step and releasing the hard water ions during a regeneration step, said method comprising:

initiating said softening step;

5 determining that a first condition is met when said resin is saturated with the hard water ions;

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determining that a second condition is met when current treated water demand is at or below a predetermined minimum flow rate;

terminating said softening step without regard to time when both of said first

10 and second conditions are met; and

initiating said regeneration step.

16. (Original) The method of claim 15 further comprising obtaining data from a hardness sensor for determining if said first condition is met.

17. (Original) The method of claim 15 wherein determining when said first condition is met comprises storing information used to make said determination.

18. (Original) The method of claim 15 wherein determining when said first condition is met comprises obtaining data from a flow meter.

19. (Original) The method of claim 15 wherein said terminating step further comprises rotating a cam.

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20. (Original) The method of claim 15 wherein determining when said second condition is met comprises obtaining data from a flow meter.

21. (Original) The method of claim 20 wherein when said current water demand is above said predetermined flow rate said controller waits a delay time, then redetermines if said current water demand exceeds said predetermined flow rate.

22. (Original) The method of claim 21 wherein said delay time is less than 30 minutes.